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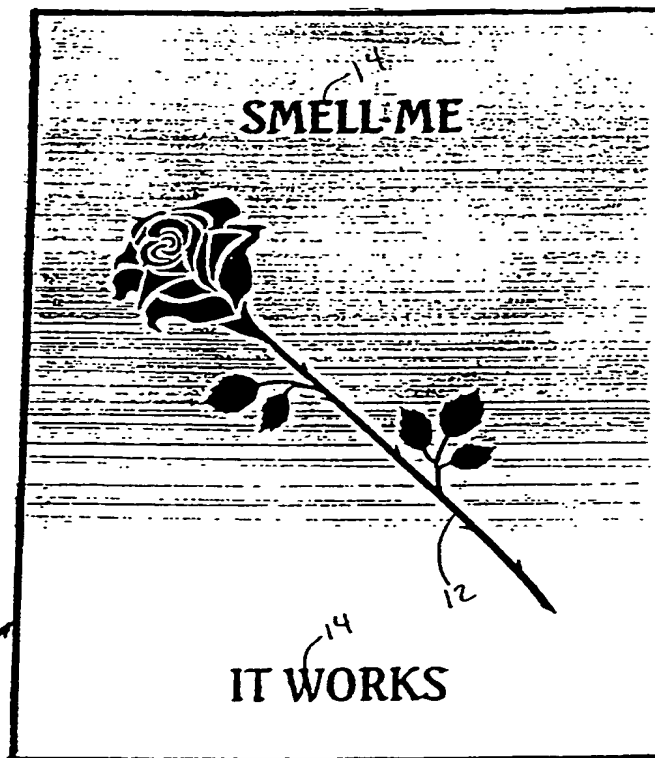
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(54) Title: FRAGRANCE-BEARING TONER

(57) Abstract: A toner for use with a printer
provides both a coloring agent for imparting
color to an imprintable substrate and a fra-
grance agent for imparting fragrance to the
substrate at the same time as the color is be-
ing imparted.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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FRAGRANCE-BEARING TONER

The present invention relates to a toner product, such as is useful in a xerographic copying machine, a computer printer, including an inkjet printer, a facsimile machine or the like. In the preferred embodiments of the invention, a fragrance is incorporated into the bulk of the particles or solutions so that the fragrance is dispersed in proportion to the particles or solutions. In one embodiment, the fragrance-bearing agent is contained in a first set of particles or a first solution, while the color-bearing agent is contained in a separate set of particles or a solution. In another embodiment, the fragrance-bearing agent is sorbed into the toner particles or is dissolved into the ink solution. In all preferred embodiments, the fragrance is effectively not activated until it is at least deposited on the paper and fixed in place.

BACKGROUND OF THE INVENTION

A review of prior art patents reveals that the incorporation of fragrance into paper products, particularly those imprinted with a coloring agent, is a desirable invention. In this specification, we will refer to two distinctly different types of coloring agents for papers or similar imprintable substrates. When we refer to "ink," we mean a colored liquid containing either a soluble colorant or a suspended colorant, where the ink is applied to a substrate in the liquid state. As the liquid carrier evaporates, the colorant is left on the substrate. The second type of coloring agent is a "toner," by which we mean a finely powdered particulate colorant material which is attracted to a substrate, typically by electrostatic charge, and then fused into place by heating of the substrate.

In one patent (U.S. Pat. 3,578,482, dated 5 May 1969), a substrate such as paper or a plastic film may be coated with a layer of frangible microcapsules containing fragrance. If the microcapsules contained ink, the substrate would provide a "carbonless" copy, as pressure applied to the substrate breaks the microcapsules, releasing the ink. However, when the microcapsules contain fragrance (as in the '482 patent), the same pressure which would release the ink instead releases the fragrance. This invention is generally referred to as "scratch

and sniff," since "scratching" the substrate, as with a fingernail, releases the fragrance.

Another patent (U.S. Pat. 4,762,493, dated 9 August 1988) teaches a scented crayon, in which the scent element is impregnated directly into the wax with the coloring agent, in quite the same manner as fragrance is incorporated into a scented candle. This patent distinguishes other art in which fragrance is dispersed from a "magic marker" device in which a wet ink is applied to the paper rather than a dry wax, but this patent, as with the prior patent, does not address the peculiar problems presented by a dry powdered ink, as will be further described below.

In U.S. Pat. 5,018,974, issued on 28 May 1991, a coloring book is provided with pages impregnated with an ink-reactive, fragrance-releasing ink. This patent teaches the application of microencapsulated fragrance onto the paper, using a wet application technique using a carrier liquid which does not dissolve the microcapsules. When a wet ink containing a solvent (such as an alcohol) for the microcapsules is applied to the paper, the opening of the microcapsules by dissolution of the wall releases the fragrance. This is different than release of the fragrance through physical breakage of the microcapsules.

In U.S. Pat. 5,039,243, dated 13 August 1991, a fragrance is microencapsulized in the wax, so that the same pressure which serves to adhere the wax to the paper also breaks the microcapsules, releasing the fragrance.

The fifth patent is U.S. Pat. 5,093,182. It issued on 3 March 1992. Rather than teaching a product where ink and fragrance are selectively dispersed together, the '182 patent teaches a transparent surface coating for a paper to uniformly distribute the fragrance over the surface. The use of such a surface coating is with fragrance samplers, such as are used in the perfume industry. The perfume is effectively "tied up" into a soluble surface polymer such as ethyl cellulose rather than being microencapsulated or directly applied to the paper. While the surface coating may accommodate printing with ink, the paper may be used in an unprinted state also.

Another patent is U.S. Pat. 5,114,735, issued on 19 May 1992. Instead of impregnating the fragrance-containing particles in the paper, the fragrance is

encapsulated into a scratch-off layer, applied in a liquid slurry. This device is useful as a scratch-off game piece where the fragrance is released by the process of removing the scratch-off layer. To that extent, it is similar to the '482 "scratch and sniff" patent, where the fragrance capsules are embedded in the paper.

5 U.S. Pat. 5,474,805, dated 12 Dec. 1995, teaches a water color paint incorporating fragrance. The fragrance-bearing microcapsules are embedded into the solid paint tablets on a palette. As the paint color is solubilized by water on the tip of a paintbrush applied to the tablet, the microcapsules are transferred onto the tip also. The application of the paint onto the paper will result in applying the
10 fragrance to the paper also. The paint is an "ink" as defined above, because it is applied in a liquid carrier.

Another patent, U.S. Pat. 5,534,105, dated 9 July 1996, deals generally with printing press technology. Specifically, it teaches a method of sealing a slurry-applied microencapsulated scent onto a substrate such as a paper, by covering the
15 scented area over with a scent-impermeable layer of a film or the like.

While U.S. Pat. 5,577,947, issued 26 November 1996, has claims very narrowly directed to a balloon having scented ink on it, the written description provided with it discusses the techniques of printing a liquid based ink containing a scent onto a substrate. The typical ink is taught as having an oil-based vehicle for
20 applying a particulate ink. It is exemplary of the fact that application fragrance with a dry-application powder-type ink is essentially unknown in the prior art.

The final patent is U.S. Pat. 5,817,385, which issued on 6 October 1998. It teaches a scented transferable tattoo device, where the microencapsulated fragrance particles are embedded into a generally continuous matrix of color
25 material, so that the process of transferring the tattoo onto the skin ruptures the microcapsules, releasing the fragrance.

It will be readily seen from the foregoing that the prior art does not teach any reliable method for simultaneously dispersing a dry particulate toner and a fragrance. A mixture of dry particulate toner with fragrance is taught by the present
30 invention, as is a method of dispersing it simultaneously with a fragrance.

SUMMARY OF THE INVENTION

This and other advantages of the present invention are achieved by a toner for imparting areas of color onto a imprintable substrate using a printer. Such a toner comprises first and second portions, the first portion being a coloring agent to impart a color when disposed onto the substrate by the printer; and the second portion being a fragrance agent to impart a fragrance when disposed onto the substrate by the printer, the respective first and second portions being dispensed onto the substrate in substantially the same ratio as they are present in the toner.

In some aspects of the invention, the first and second portions are each contained in a plurality of a first set of particles in the toner. In other aspects of the invention, the first portion of the coloring agent is contained in a first set of particles and the second portion of the fragrance agent is contained in a second set of particles, with the first and second sets of particles being dispensed by the printer in substantially the same ratio as they are present in the toner.

Other aspects of the invention are achieved by a toner cartridge for use with a printer in imparting areas of color and fragrance onto an imprintable substrate. Such a cartridge comprises at least one toner-containing compartment; at least one toner and means for dispensing the at least one toner from said toner-containing compartment. The at least one toner comprises a first portion of a coloring agent to impart a color when disposed onto the substrate by the printer and a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer. The means for dispensing the at least one toner operates such that the coloring agent and the fragrance agent are dispensed in substantially the same ratio as they are present in the at least one toner.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is best understood when reference is made to the accompanying drawings, where identical parts are identified with identical reference numerals and wherein:

FIGURE 1 shows a plan view of a substrate simultaneously imprinted with color and fragrance, the color and fragrance imprinted using the same particles

of a toner; and

FIGURE 2 shows a plan view of a substrate simultaneously imprinted with color and fragrance, the color and fragrance imprinted using separate sets of particles in a toner cartridge.

5

DETAILED DESCRIPTION OF THE PREFERRED INVENTION

Current document printing and reproduction techniques generally fall into one of two classifications, each of which is different from a traditional "ink" as is used in offset printing. For that reason, traditional offset printing ink problem solutions are not readily applicable to these new document printing techniques. In one method, for example, a very finely atomized liquid is sprayed through a nozzle onto a substrate in discrete droplets, in a technique we will refer to as "ink-jet" printing. Due to the small size of the nozzle and the high frequencies used to generate the discrete droplets, the particle sizes used in the colorant (and any other solid present in the material) are extremely critical to allow reliable use. Usually a volatile solvent is used in association with this technique as a carrier. In such an inkjet technique, or other droplet-based technology, the fragrance-bearing agent may be present in either the particles or the carrier solution. In the second method, a dry toner is comprised of an extremely finely powdered material. Portions of a substrate surface to be coated are electrostatically charged. When these portions are brought near the toner, the particles are electrostatically attracted and adhered to the surface. If the substrate is then heated, fusers in the substrate and/or the toner cause the toner particles to be affixed to the substrate. Although early versions of this method tended to prefer putting the fuser in the substrate, the demand for "plain paper" copying has caused the fuser in recent years to be almost exclusively in the toner. This second method is used in xerographic copying, laser printing, and similar techniques commonly practiced in computer printers, xerographic copiers and facsimile machines, just to name a few of the devices.

The primary thrust of the present invention is simultaneously dispensing fragrance and color, typically with a fused toner technique, but also with an inkjet technique. For this reason, the general term "toner" will refer hereinafter to either

an solvent-based system or a dry toner-based system. Since the fused toner has no solvent present, the fragrance which will be co-dispensed must be present in a particulate form, either in the same particles as the toner or in separate compatible particles. Three basic properties characterize the toner particles. The first is size.

5 Since the toner particles are preferably generally spherical, a mean diameter can be specified for the individual particles and the mixture of particles will exhibit a statistical range of mean diameters. To properly fluidize the particles for the adherence to the substrate, it may be quite desirable to have a known particle size range, and persons of skill in this printing technique will be familiar with the desired

10 range. The second critical property is density. Just as particle size affects the ability to fluidize, density is also critical. The third critical property is the ability of the particle to be electrostatically attracted. If discretely different particles are used for the colorant and the fragrance in a fragrance-bearing toner, and if the particles are not carefully selected, the absence of a solvent carrier to hold the different particles

15 together will result in the mixture segregating into separate colorant and scent phases. In other words, either the colorant particles or the fragrance particles will be preferentially applied to the substrate. In one instance, this would result in an unscented coloration and in the other instance, it would result in a scented, albeit invisible printing of the substrate. While the matching of the colorant and the

20 fragrance onto discrete separate particles is a delicate problem, it is not without resolution.

An alternate solution, which is probably preferred, is to impregnate a fragrance agent into a colorant particle, as is already known and commercially available. Since fragrance is imparted through volatilization of the chemical

25 compounds, the fragrance agent is inherently volatile. If the colorant particle is properly selected, it can provide a high surface area through internal pores and the like for absorbing the fragrance agent. The heat used in fusing the colorant particle to the substrate will generally be useful in volatilizing the fragrance agent out of the internal pores, where it is held. The varying pore diameters available in a given

30 particle will tend to distribute the diffusion rates of the fragrance agent, aiding in maintaining the fragrant nature of the printed substrate. It is expected that a finely

powdered clay or earth material having a high surface area per unit volume would be very useful in this technique, as may be a finely powdered polymeric material.

The latter material presents the added advantage of being fusable in the heating process, to assist the affixation of the toner to the substrate. This has become more important with the high preference for "plain paper" copying. Sorption of the fragrance agent into internal pores rather than the external surface of the particles also has the advantage of not affecting gross surface properties, which are important in preventing clumping or other aggregations of the particles while they are in reserve prior to use.

Once it is known to associate a given fragrance agent with a given colorant, such as fragrance agent "A" with a blue colorant particle and fragrance agent "B" with a red particle, for example, it would be within the scope of this invention to juxtapose the combined colorant/fragrance particles on the substrate in various proportions in a manner which would allow a complete spectrum of fragrances from "A" to an "AB" mix and then to pure "B" due to the same proportionate blending of the particles which would result in a spectrum of colors, such as from a pure blue to a purple and then to a pure red, as would be achieved by combining the portions of blue and red.

In other aspects of the invention, as in the inkjet techniques, the fragrance-bearing agent may be in either the microparticle form or soluble in the carrier solvent and the color-bearing agent may be present in either a microparticle form or soluble in the carrier solvent. In any case, the effective use of the technique requires simultaneous and proportional application of the two agents in the same proportion as they are present in the toner.

In other aspects of the invention, one or more fragrance agents may be disposed in separate compartments in the toner cartridge, in the same manner that the separate colors are disposed in separate compartments of the known prior art toner cartridges. In this way, it is possible to effectively dispense the fragrance agent onto the paper without dispensing toner simultaneously, although toner can be dispensed simultaneously if desired. One problem which has been observed in some early applications of the present invention is that the normal density of toner

on a printed page, especially a printed page containing only words, is sufficiently low that it is necessary to include a graphical element on a printed page in order to impart an effective amount of the fragrance agent onto the page. When the fragrance agent is contained in a non-coloring compartment of the toner cartridge and the printer is instructed to paint either the entire page surface, or even a significant portion thereof, with such a non-coloring fragrance agent, then an effective amount of the fragrance agent may be dispensed onto the paper without requiring changes in the visual content of the page. This concept is illustrated in Figures 1 and 2. In Fig. 1, a toner containing fragrance agent is fused to a piece of an imprintable substrate, shown generally as a piece of paper 10, in a print density sufficiently high to allow easy detection of the fragrance, although a graphical element 12 and broad lettering elements 14 are necessary in order to cover enough area on the page to accomplish this purpose. However, in Fig. 2, the toner cartridge is equipped with a non-coloring fragrance agent in a compartment thereof, so that the same effect, or a heightened effect, from that achieved in Fig. 1 is obtained by "imprinting" the non-coloring toner onto a portion 116 of an imprintable substrate, shown generally as a piece of paper 110, on which conventional non-fragrant toner has been used to imprint graphical element 112 and broad lettering elements 114. Since the toner used in area 116 is non-coloring, its presence is not readily detectable to the untrained observer and the border delineating area 116 is shown as a dashed line only to designate the area, as such a line would not be present on the actual page 110. Further, although area 116 on Fig. 2 is shown as being exclusive from the printed areas 112 and 114 (containing graphical elements and broad lettering elements, respectively), it is to be understood that area 116 could overlap portions of, or even all of, the printed areas 112 and 114. Also, while area 116 is shown in Fig. 2 as comprising less than the entire area of the page 110, the invention is not limited to circumstances where the area 116 is less than the entire area of the page.

The present invention, as described above, is widely applicable to a large variety of printing technologies that are currently available commercially, and the invention is expected to be adaptable to be used with new printing technologies as

they emerge. Coverage of the present invention is intended to cover at least the following types of printers and copiers: laserjet, inkjet, color copier, printer scanner copier, office copier, deskjet, digital dye sublimation, digital copier, solid ink color printer, thermal printer, laser printer, dry ink color printer, dry printer, dry ink printer, 5 digital printer, monochrome laser, and digital color copier. It will also be understood that the phrase "printers and copiers" encompasses a variety of printing situations, including xerographic copying, facsimile machines, printers for personal computers, etc.

While the present invention has been described according to the best mode 10 known to the inventors, the scope and extent of the invention is not to be measured by the written description, but is instead to be determined by the scope of the claims attached to and made a part hereof.

CLAIMS

What we claim is:

1. A toner for imparting areas of color onto a imprintable substrate using a printer, comprising:
 - a first portion of a coloring agent to impart a color when disposed onto the substrate by the printer; and
 - a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer;wherein said first and second portions are dispensed onto the substrate in substantially the same ratio as they are present in the toner.
2. The toner of Claim 1, wherein the first portion and the second portion are each contained in a plurality of a first set of particles in the toner.
3. The toner of Claim 1, wherein the first portion of the coloring agent is contained in a first set of particles and the second portion of the fragrance agent is contained in a second set of particles, said first and second sets of particles being dispensed by the printer in substantially the same ratio as they are present in the toner.
4. The toner of Claim 1, wherein the first portion is contained in suspended microparticles in a solution containing the second portion of fragrance agent as a solute.
5. The toner of Claim 1, wherein the second portion is contained in suspended microparticles in a solution containing the first portion of color agent as a solute.
6. The toner of Claim 1, wherein the first and second portions are each soluble in a carrier solvent.
7. The toner of Claim 2, wherein the particles in the first set of particles are

porous, with the coloring agent in the body of the particles and the fragrance agent sorbed into the pores of the particles.

8. The toner of Claim 2 wherein the particles in the first set of particles have the coloring agent in the body of the particles and the fragrance agent on an external surface of the particles.

9. A toner cartridge for use with a printer in imparting areas of color and fragrance onto an imprintable substrate, the cartridge comprising:

at least one toner containing compartment;

at least one toner contained in one of the at least one toner containing compartments, the at least one toner comprising a first portion of a coloring agent to impart a color when disposed onto the substrate by the printer and a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer; and

means for dispensing said at least one toner from said toner containing compartment such that the coloring agent and the fragrance agent are dispensed in substantially the same ratio as they are present in the at least one toner.

10. A method for imparting areas of color and fragrance onto a imprintable substrate using a printer, comprising the steps of:

- 1) providing a toner for said printer, said toner comprising a first portion of a coloring agent to impart a color and a second portion of a fragrance agent to impart a fragrance;
- 2) causing the printer to dispense the toner onto the imprintable substrate such that the first and second portions are dispensed onto the substrate in substantially the same ratio as they are present in the toner;
- 3) fixing the first and second portions to the substrate.

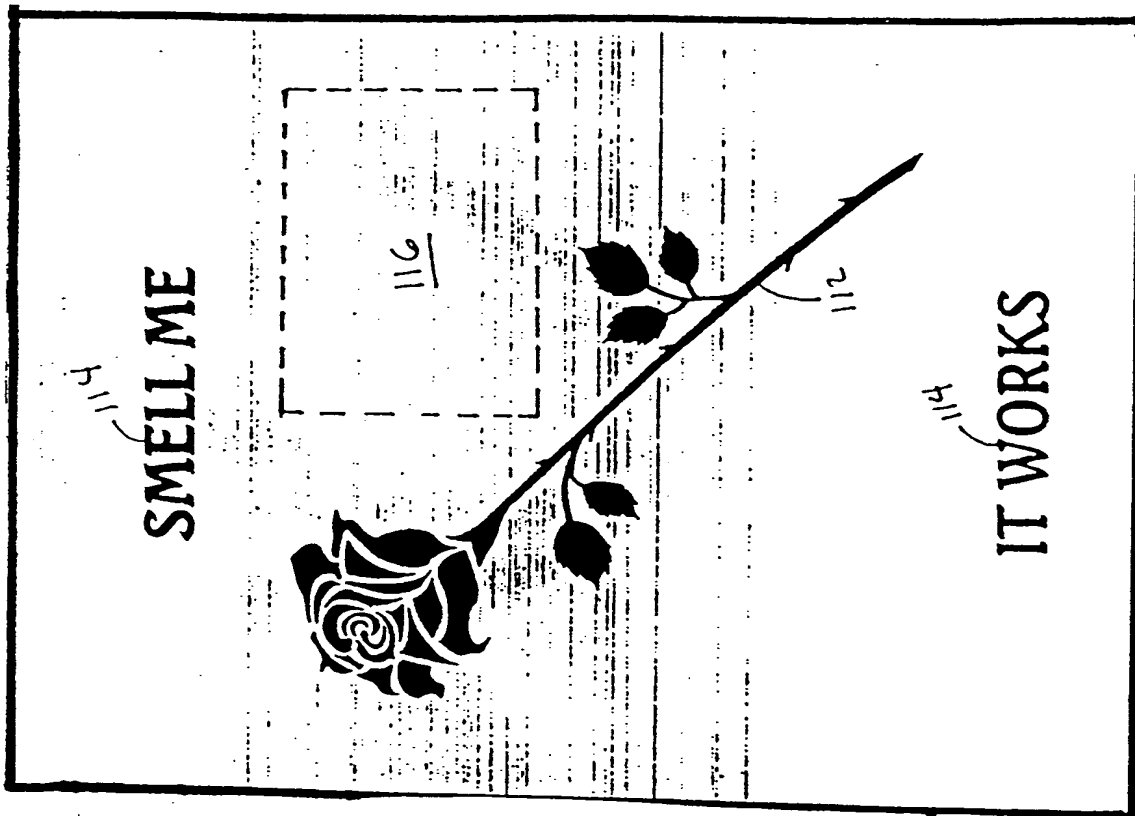


Fig. 2

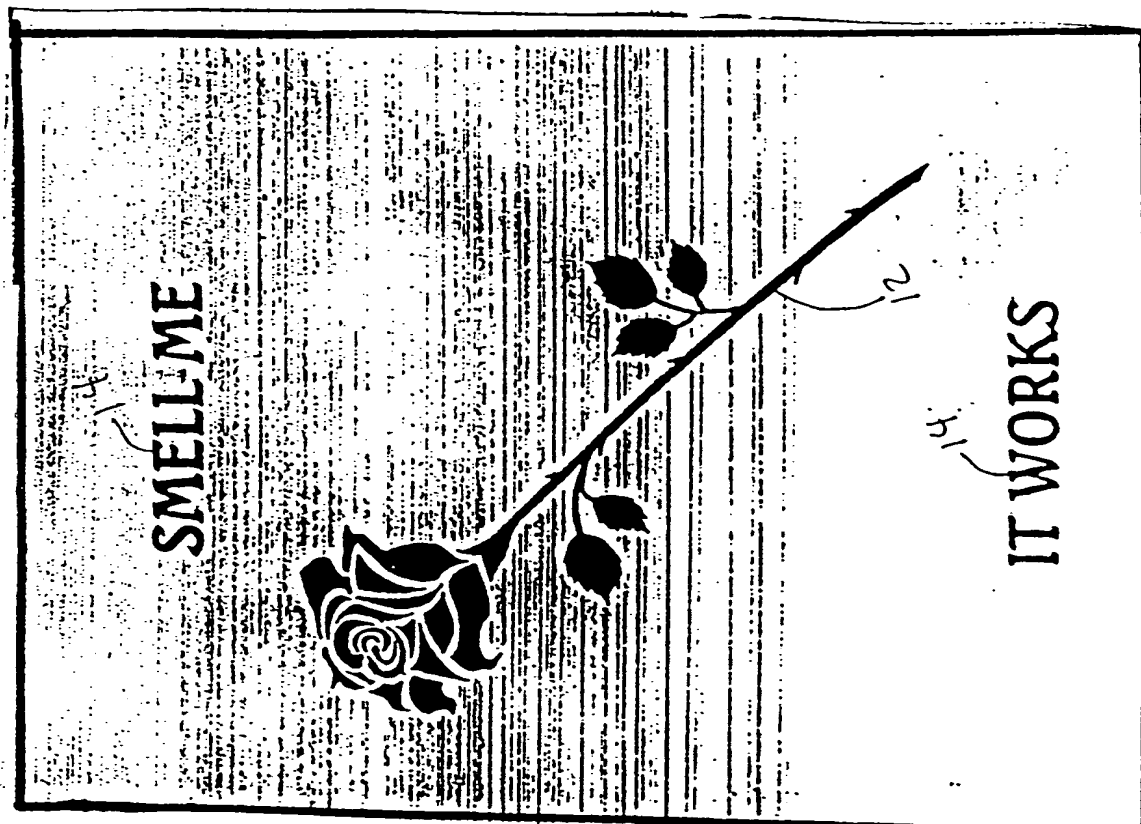


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/16873

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G03G 9/00

US CL : 430/110

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 430/110

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST: toner, fragrance

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,716,751 A (BERTAND et al.) 10 February 1998, claims.	1-10
X	US 5,667,924 A (ZIOLO) 16 September 1997, col. 17, lines 45-52.	1-10
X	US 5,558,968 A (RUSSELL et al.) 24 September 1996, col. 4 line 19.	1-10
X	JP 62-160464 A (MINAMITANI et al.) 16 July 1987, entire document.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

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22 AUGUST 2000

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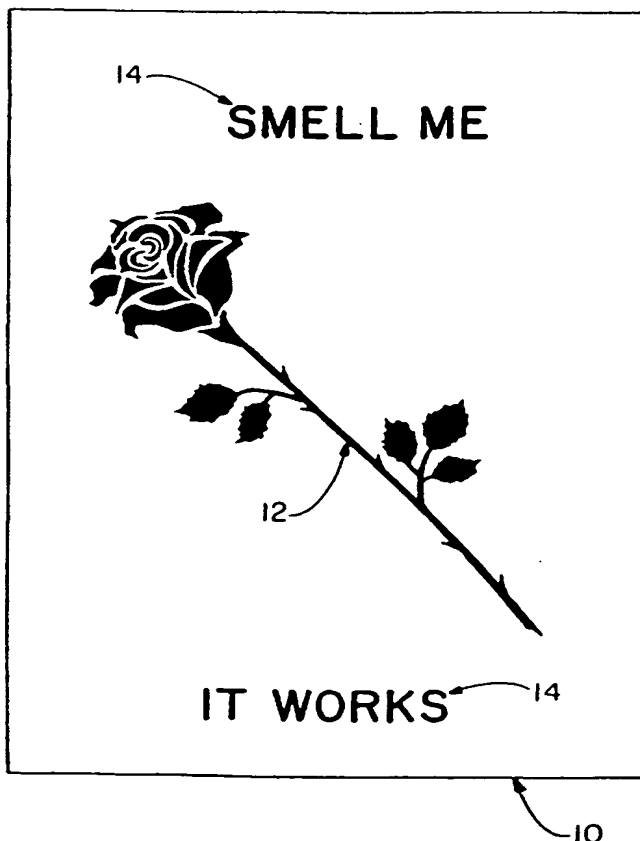
[US/US]; 398 E. Rayen Avenue, Youngstown, OH 44505 (US). **DUGRENIER, Robert** [US/US]; RR #1 Box 2909, Townshend, VT 05353 (US). **WINNEGRAD, Ronald, Ross** [US/US]; 54 Grandview Place, Montclair, NJ 07043 (US).

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(54) Title: **FRAGRANCE-BEARING TONER**



(57) Abstract: A toner for use with a printer provides both a coloring agent for imparting color to an imprintable substrate and a fragrance agent for imparting fragrance to the substrate at the same time as the color is being imparted.

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10 sorbed into the toner particles or is dissolved into the ink solution. In all preferred embodiments, the fragrance is effectively not activated until it is at least deposited on the paper and fixed in place.

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15 A review of prior art patents reveals that the incorporation of fragrance into paper products, particularly those imprinted with a coloring agent, is a desirable invention. In this specification, we will refer to two distinctly different types of coloring agents for papers or similar imprintable substrates. When we refer to "ink," we mean a colored liquid containing either a soluble colorant or a suspended
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and sniff," since "scratching" the substrate, as with a fingernail, releases the fragrance.

Another patent (U.S. Pat. 4,762,493, dated 9 August 1988) teaches a scented crayon, in which the scent element is impregnated directly into the wax with the coloring agent, in quite the same manner as fragrance is incorporated into a scented candle. This patent distinguishes other art in which fragrance is dispersed from a "magic marker" device in which a wet ink is applied to the paper rather than a dry wax, but this patent, as with the prior patent, does not address the peculiar problems presented by a dry powdered ink, as will be further described below.

In U.S. Pat. 5,018,974, issued on 28 May 1991, a coloring book is provided with pages impregnated with an ink-reactive, fragrance-releasing ink. This patent teaches the application of microencapsulated fragrance onto the paper, using a wet application technique using a carrier liquid which does not dissolve the microcapsules. When a wet ink containing a solvent (such as an alcohol) for the microcapsules is applied to the paper, the opening of the microcapsules by dissolution of the wall releases the fragrance. This is different than release of the fragrance through physical breakage of the microcapsules.

In U.S. Pat. 5,039,243, dated 13 August 1991, a fragrance is microencapsulized in the wax, so that the same pressure which serves to adhere the wax to the paper also breaks the microcapsules, releasing the fragrance.

The fifth patent is U.S. Pat. 5,093,182. It issued on 3 March 1992. Rather than teaching a product where ink and fragrance are selectively dispersed together, the '182 patent teaches a transparent surface coating for a paper to uniformly distribute the fragrance over the surface. The use of such a surface coating is with fragrance samplers, such as are used in the perfume industry. The perfume is effectively "tied up" into a soluble surface polymer such as ethyl cellulose rather than being microencapsulated or directly applied to the paper. While the surface coating may accommodate printing with ink, the paper may be used in an unprinted state also.

Another patent is U.S. Pat. 5,114,735, issued on 19 May 1992. Instead of impregnating the fragrance-containing particles in the paper, the fragrance is

encapsulated into a scratch-off layer, applied in a liquid slurry. This device is useful as a scratch-off game piece where the fragrance is released by the process of removing the scratch-off layer. To that extent, it is similar to the '482 "scratch and sniff" patent, where the fragrance capsules are embedded in the paper.

5 U.S. Pat. 5,474,805, dated 12 Dec. 1995, teaches a water color paint incorporating fragrance. The fragrance-bearing microcapsules are embedded into the solid paint tablets on a palette. As the paint color is solubilized by water on the tip of a paintbrush applied to the tablet, the microcapsules are transferred onto the tip also. The application of the paint onto the paper will result in applying the
10 fragrance to the paper also. The paint is an "ink" as defined above, because it is applied in a liquid carrier.

Another patent, U.S. Pat. 5,534,105, dated 9 July 1996, deals generally with printing press technology. Specifically, it teaches a method of sealing a slurry-applied microencapsulated scent onto a substrate such as a paper, by covering the
15 scented area over with a scent-impermeable layer of a film or the like.

While U.S. Pat. 5,577,947, issued 26 November 1996, has claims very narrowly directed to a balloon having scented ink on it, the written description provided with it discusses the techniques of printing a liquid based ink containing a scent onto a substrate. The typical ink is taught as having an oil-based vehicle for
20 applying a particulate ink. It is exemplary of the fact that application fragrance with a dry-application powder-type ink is essentially unknown in the prior art.

The final patent is U.S. Pat. 5,817,385, which issued on 6 October 1998. It teaches a scented transferable tattoo device, where the microencapsulated fragrance particles are embedded into a generally continuous matrix of color
25 material, so that the process of transferring the tattoo onto the skin ruptures the microcapsules, releasing the fragrance.

It will be readily seen from the foregoing that the prior art does not teach any reliable method for simultaneously dispersing a dry particulate toner and a fragrance. A mixture of dry particulate toner with fragrance is taught by the present
30 invention, as is a method of dispersing it simultaneously with a fragrance.

SUMMARY OF THE INVENTION

This and other advantages of the present invention are achieved by a toner for imparting areas of color onto a imprintable substrate using a printer. Such a toner comprises first and second portions, the first portion being a coloring agent to
5 impart a color when disposed onto the substrate by the printer; and the second portion being a fragrance agent to impart a fragrance when disposed onto the substrate by the printer, the respective first and second portions being dispensed onto the substrate in substantially the same ratio as they are present in the toner.

In some aspects of the invention, the first and second portions are each contained
10 in a plurality of a first set of particles in the toner. In other aspects of the invention, the first portion of the coloring agent is contained in a first set of particles and the second portion of the fragrance agent is contained in a second set of particles, with the first and second sets of particles being dispensed by the printer in substantially the same ratio as they are present in the toner.

15 Other aspects of the invention are achieved by a toner cartridge for use with a printer in imparting areas of color and fragrance onto an imprintable substrate. Such a cartridge comprises at least one toner-containing compartment; at least one toner and means for dispensing the at least one toner from said toner-containing compartment. The at least one toner comprises a first portion of a coloring agent
20 to impart a color when disposed onto the substrate by the printer and a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer. The means for dispensing the at least one toner operates such that the coloring agent and the fragrance agent are dispensed in substantially the same ratio as they are present in the at least one toner.

25

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is best understood when reference is made to the accompanying drawings, where identical parts are identified with identical reference numerals and wherein:

30 FIGURE 1 shows a plan view of a substrate simultaneously imprinted with color and fragrance, the color and fragrance imprinted using the same particles

of a toner; and

FIGURE 2 shows a plan view of a substrate simultaneously imprinted with color and fragrance, the color and fragrance imprinted using separate sets of particles in a toner cartridge.

5

DETAILED DESCRIPTION OF THE PREFERRED INVENTION

Current document printing and reproduction techniques generally fall into one of two classifications, each of which is different from a traditional "ink" as is used in offset printing. For that reason, traditional offset printing ink problem solutions are not readily applicable to these new document printing techniques. In one method, for example, a very finely atomized liquid is sprayed through a nozzle onto a substrate in discrete droplets, in a technique we will refer to as "ink-jet" printing. Due to the small size of the nozzle and the high frequencies used to generate the discrete droplets, the particle sizes used in the colorant (and any other solid present in the material) are extremely critical to allow reliable use. Usually a volatile solvent is used in association with this technique as a carrier. In such an inkjet technique, or other droplet-based technology, the fragrance-bearing agent may be present in either the particles or the carrier solution. In the second method, a dry toner is comprised of an extremely finely powdered material. Portions of a substrate surface to be coated are electrostatically charged. When these portions are brought near the toner, the particles are electrostatically attracted and adhered to the surface.

If the substrate is then heated, fusers in the substrate and/or the toner cause the toner particles to be affixed to the substrate. Although early versions of this method tended to prefer putting the fuser in the substrate, the demand for "plain paper" copying has caused the fuser in recent years to be almost exclusively in the toner. This second method is used in xerographic copying, laser printing, and similar techniques commonly practiced in computer printers, xerographic copiers and facsimile machines, just to name a few of the devices.

The primary thrust of the present invention is simultaneously dispensing fragrance and color, typically with a fused toner technique, but also with an inkjet technique. For this reason, the general term "toner" will refer hereinafter to either

an solvent-based system or a dry toner-based system. Since the fused toner has no solvent present, the fragrance which will be co-dispensed must be present in a particulate form, either in the same particles as the toner or in separate compatible particles. Three basic properties characterize the toner particles. The first is size.

5 Since the toner particles are preferably generally spherical, a mean diameter can be specified for the individual particles and the mixture of particles will exhibit a statistical range of mean diameters. To properly fluidize the particles for the adherence to the substrate, it may be quite desirable to have a known particle size range, and persons of skill in this printing technique will be familiar with the desired

10 range. The second critical property is density. Just as particle size affects the ability to fluidize, density is also critical. The third critical property is the ability of the particle to be electrostatically attracted. If discretely different particles are used for the colorant and the fragrance in a fragrance-bearing toner, and if the particles are not carefully selected, the absence of a solvent carrier to hold the different particles

15 together will result in the mixture segregating into separate colorant and scent phases. In other words, either the colorant particles or the fragrance particles will be preferentially applied to the substrate. In one instance, this would result in an unscented coloration and in the other instance, it would result in a scented, albeit invisible printing of the substrate. While the matching of the colorant and the

20 fragrance onto discrete separate particles is a delicate problem, it is not without resolution.

An alternate solution, which is probably preferred, is to impregnate a fragrance agent into a colorant particle, as is already known and commercially available. Since fragrance is imparted through volatilization of the chemical

25 compounds, the fragrance agent is inherently volatile. If the colorant particle is properly selected, it can provide a high surface area through internal pores and the like for absorbing the fragrance agent. The heat used in fusing the colorant particle to the substrate will generally be useful in volatilizing the fragrance agent out of the internal pores, where it is held. The varying pore diameters available in a given

30 particle will tend to distribute the diffusion rates of the fragrance agent, aiding in maintaining the fragrant nature of the printed substrate. It is expected that a finely

powdered clay or earth material having a high surface area per unit volume would be very useful in this technique, as may be a finely powdered polymeric material. The latter material presents the added advantage of being fusable in the heating process, to assist the affixation of the toner to the substrate. This has become more
5 important with the high preference for "plain paper" copying. Sorption of the fragrance agent into internal pores rather than the external surface of the particles also has the advantage of not affecting gross surface properties, which are important in preventing clumping or other aggregations of the particles while they are in reserve prior to use.

10 Once it is known to associate a given fragrance agent with a given colorant, such as fragrance agent "A" with a blue colorant particle and fragrance agent "B" with a red particle, for example, it would be within the scope of this invention to juxtapose the combined colorant/fragrance particles on the substrate in various proportions in a manner which would allow a complete spectrum of fragrances from
15 "A" to an "AB" mix and then to pure "B" due to the same proportionate blending of the particles which would result in a spectrum of colors, such as from a pure blue to a purple and then to a pure red, as would be achieved by combining the portions of blue and red.

 In other aspects of the invention, as in the inkjet techniques, the fragrance-
20 bearing agent may be in either the microparticle form or soluble in the carrier solvent and the color-bearing agent may be present in either a microparticle form or soluble in the carrier solvent. In any case, the effective use of the technique requires simultaneous and proportional application of the two agents in the same proportion as they are present in the toner.

25 In other aspects of the invention, one or more fragrance agents may be disposed in separate compartments in the toner cartridge, in the same manner that the separate colors are disposed in separate compartments of the known prior art toner cartridges. In this way, it is possible to effectively dispense the fragrance agent onto the paper without dispensing toner simultaneously, although toner can
30 be dispensed simultaneously if desired. One problem which has been observed in some early applications of the present invention is that the normal density of toner

on a printed page, especially a printed page containing only words, is sufficiently low that it is necessary to include a graphical element on a printed page in order to impart an effective amount of the fragrance agent onto the page. When the fragrance agent is contained in a non-coloring compartment of the toner cartridge and the printer is instructed to paint either the entire page surface, or even a significant portion thereof, with such a non-coloring fragrance agent, then an effective amount of the fragrance agent may be dispensed onto the paper without requiring changes in the visual content of the page. This concept is illustrated in Figures 1 and 2. In Fig. 1, a toner containing fragrance agent is fused to a piece of an imprintable substrate, shown generally as a piece of paper 10, in a print density sufficiently high to allow easy detection of the fragrance, although a graphical element 12 and broad lettering elements 14 are necessary in order to cover enough area on the page to accomplish this purpose. However, in Fig. 2, the toner cartridge is equipped with a non-coloring fragrance agent in a compartment thereof, so that the same effect, or a heightened effect, from that achieved in Fig. 1 is obtained by "imprinting" the non-coloring toner onto a portion 116 of an imprintable substrate, shown generally as a piece of paper 110, on which conventional non-fragrant toner has been used to imprint graphical element 112 and broad lettering elements 114. Since the toner used in area 116 is non-coloring, its presence is not readily detectable to the untrained observer and the border delineating area 116 is shown as a dashed line only to designate the area, as such a line would not be present on the actual page 110. Further, although area 116 on Fig. 2 is shown as being exclusive from the printed areas 112 and 114 (containing graphical elements and broad lettering elements, respectively), it is to be understood that area 116 could overlap portions of, or even all of, the printed areas 112 and 114. Also, while area 116 is shown in Fig. 2 as comprising less than the entire area of the page 110, the invention is not limited to circumstances where the area 116 is less than the entire area of the page.

The present invention, as described above, is widely applicable to a large variety of printing technologies that are currently available commercially, and the invention is expected to be adaptable to be used with new printing technologies as

they emerge. Coverage of the present invention is intended to cover at least the following types of printers and copiers: laserjet, inkjet, color copier, printer scanner copier, office copier, deskjet, digital dye sublimation, digital copier, solid ink color printer, thermal printer, laser printer, dry ink color printer, dry printer, dry ink printer, 5 digital printer, monochrome laser, and digital color copier. It will also be understood that the phrase "printers and copiers" encompasses a variety of printing situations, including xerographic copying, facsimile machines, printers for personal computers, etc.

While the present invention has been described according to the best mode 10 known to the inventors, the scope and extent of the invention is not to be measured by the written description, but is instead to be determined by the scope of the claims attached to and made a part hereof.

CLAIMS

What we claim is:

1. A toner for imparting areas of color onto a imprintable substrate using a printer, comprising:
 - a first portion of a coloring agent to impart a color when disposed onto the substrate by the printer; and
 - a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer;wherein said first and second portions are dispensed onto the substrate in substantially the same ratio as they are present in the toner.
2. The toner of Claim 1, wherein the first portion and the second portion are each contained in a plurality of a first set of particles in the toner.
3. The toner of Claim 1, wherein the first portion of the coloring agent is contained in a first set of particles and the second portion of the fragrance agent is contained in a second set of particles, said first and second sets of particles being dispensed by the printer in substantially the same ratio as they are present in the toner.
4. The toner of Claim 1, wherein the first portion is contained in suspended microparticles in a solution containing the second portion of fragrance agent as a solute.
5. The toner of Claim 1, wherein the second portion is contained in suspended microparticles in a solution containing the first portion of color agent as a solute.
6. The toner of Claim 1, wherein the first and second portions are each soluble in a carrier solvent.
7. The toner of Claim 2, wherein the particles in the first set of particles are

porous, with the coloring agent in the body of the particles and the fragrance agent sorbed into the pores of the particles.

8. The toner of Claim 2 wherein the particles in the first set of particles have the coloring agent in the body of the particles and the fragrance agent on an external surface of the particles.

9. A toner cartridge for use with a printer in imparting areas of color and fragrance onto an imprintable substrate, the cartridge comprising:

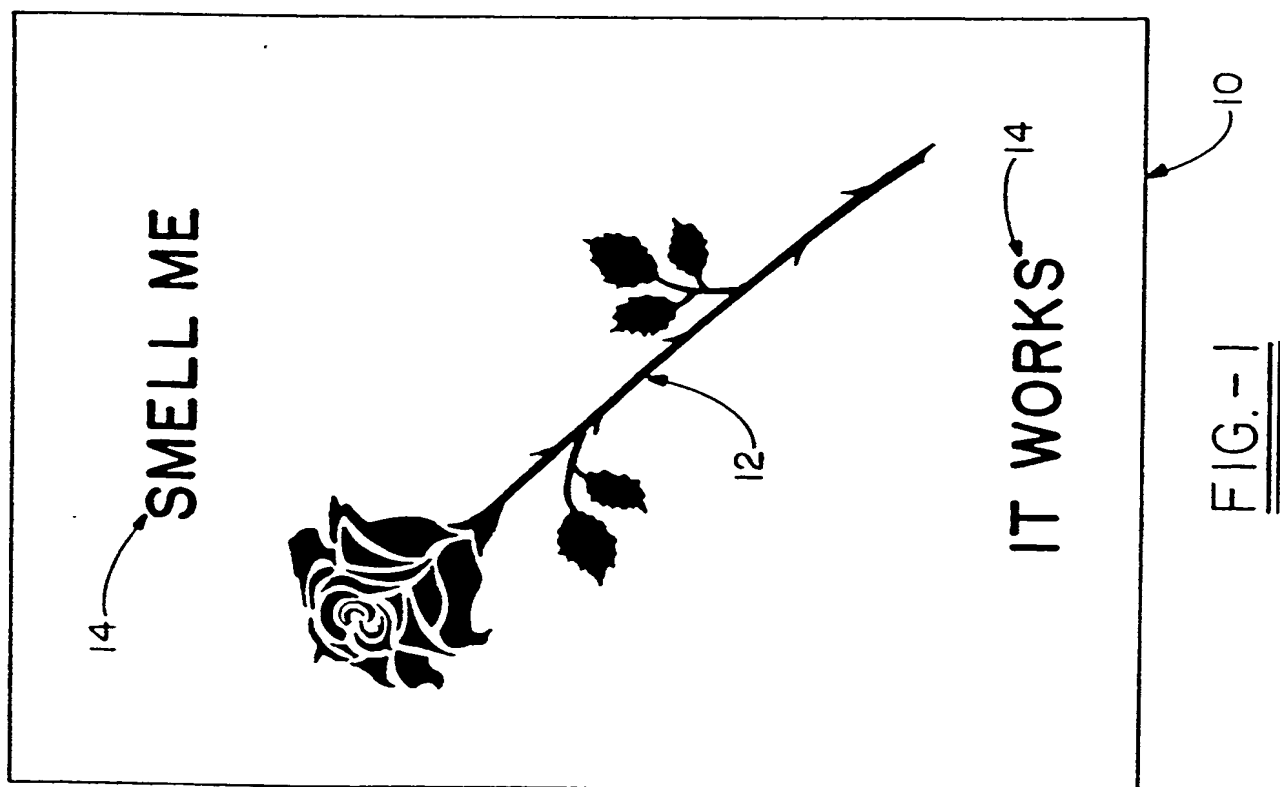
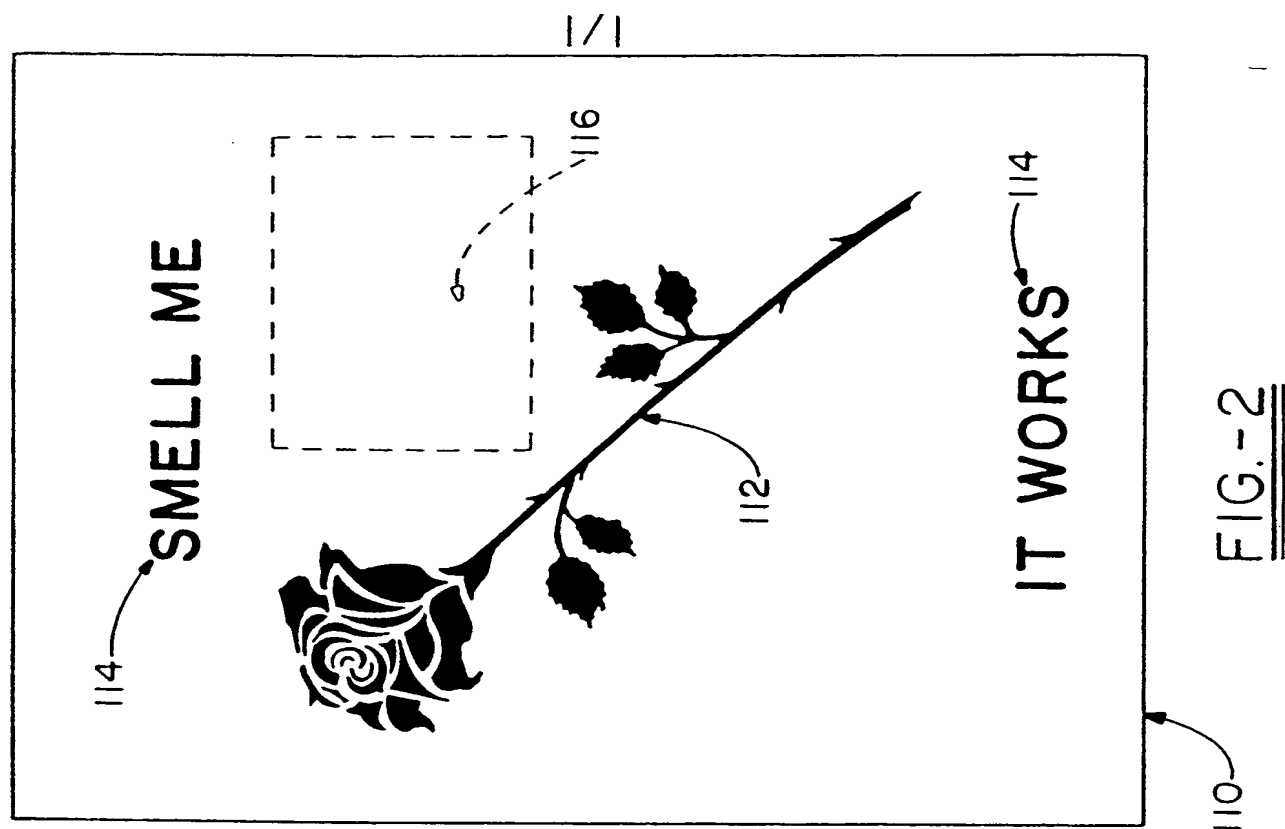
at least one toner containing compartment;

at least one toner contained in one of the at least one toner containing compartments, the at least one toner comprising a first portion of a coloring agent to impart a color when disposed onto the substrate by the printer and a second portion of a fragrance agent to impart a fragrance when disposed onto the substrate by the printer; and

means for dispensing said at least one toner from said toner containing compartment such that the coloring agent and the fragrance agent are dispensed in substantially the same ratio as they are present in the at least one toner.

10. A method for imparting areas of color and fragrance onto a imprintable substrate using a printer, comprising the steps of:

- 1) providing a toner for said printer, said toner comprising a first portion of a coloring agent to impart a color and a second portion of a fragrance agent to impart a fragrance;
- 2) causing the printer to dispense the toner onto the imprintable substrate such that the first and second portions are dispensed onto the substrate in substantially the same ratio as they are present in the toner;
- 3) fixing the first and second portions to the substrate.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/16873

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G03G 9/00

US CL : 430/110

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 430/110

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST: toner, fragrance

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,716,751 A (BERTAND et al.) 10 February 1998, claims.	1-10
X	US 5,667,924 A (ZIOLO) 16 September 1997, col. 17, lines 45-52.	1-10
X	US 5,558,968 A (RUSSELL et al.) 24 September 1996, col. 4 line 19.	1-10
X	JP 62-160464 A (MINAMITANI et al.) 16 July 1987, entire document.	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	* T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A* document defining the general state of the art which is not considered to be of particular relevance	* X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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* L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* &* document member of the same patent family
* O* document referring to an oral disclosure, use, exhibition or other means	
* P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

22 AUGUST 2000

Date of mailing of the international search report

06 SEP 2000

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